Réunions scientifiques

Séminaires

On-line mirror surfacing : a novel approach to the nanofocusing problem

L. PEVERINI

(European Synchrotron Radiation Facility, Grenoble, France)

Invité par Mourad IDIR

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A novel fabrication scheme has been developed at the ESRF BM5 beamline to realize the final surfacing of nanofocusing X-ray mirrors. It will provide a valuable and complementary alternative to the existing technologies for realizing the next generation of reflective X-ray optics for synchrotron and FEL radiation sources.

The method combines a non-contact mirror-surfacing tool (ion beam polishing or differential deposition) with two on-line metrology instruments that use X-rays under grazing incidence as a probe to monitor both mirror figure and finish. Information on the mirror figure (slope errors, phase) is extracted from the interferograms obtained with an X-ray shearing interferometer placed in the reflected beam so that the effect of all process parameters on the mirror figure can be monitored in-situ and in real-time.

Alternatively, since the presence of sub-micrometer features on the surface profile may reduce the reflectivity of the mirror and degrade the image quality, it is important to monitor as well the evolution of the surface finish. This is obtained by simply replacing the interferometer with a 2D detector, without modifying the environment and geometry at the mirror level. The 1-dimensional Power Spectral Density characterizing the evolution of the optical properties of the mirror surface is derived directly from the X-ray diffuse scattering diagrams recorded. In the case of differential deposition (growth of a single film onto a substrate), the power spectral density functions characterizing the external film surface roughness and the film-substrate roughness conformity can be uniquely extracted from a single sequence of scattering diagrams measured at a grazing incidence angle exceeding the critical angle of total external reflection.

This presentation will review some recent achievements and will present pertinent examples of on-line diagnostics for which X-rays prove to be a unique probe. These preliminary experiments anticipate the possibility of realizing a short feedback loop for machining an X-ray mirror capable of nanofocusing performance.

Formalités d'entrée *: accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi Soleil du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).*

SYNCHROTRON SOLEIL
Division Expériences - L'Orme des merisiers - Saint-Aubin - BP 48 – 91192 GIF S/YVETTE Cedex
http://www.synchrotron-soleil.fr/portal/page/portal/Soleil/ToutesActualites
Secrétariat Division Expériences : sandrine.vasseur@synchrotron-soleil.fr